

## INSECTS FEEDING OR BREEDING ON INDIGO, BAPTISIA

By S. W. FROST

THE PENNSYLVANIA STATE COLLEGE

Wild indigo is an interesting group of plants especially from the standpoint of the insects that feed upon its flowers, leaves, stems or seeds. The genus belongs to the Leguminosæ (the Fabaceæ, according to some authorities) and comprises thirty-one species that are confined to the eastern portion of North America and range from Maine to Florida, west to Minnesota and south to Texas. Some of the species occur in the immediate portions of Mexico and Canada. Only two species occur in Pennsylvania namely, *Baptisia tinctoria* (L.), commonly known as wild indigo, yellow broom, indigo broom or horsefly weed, and *Baptisia australis* (L.), known as blue false indigo.<sup>1</sup> *Baptisia tinctoria* is the more common of the two species in Pennsylvania and it is from this species that the writer collected many insects. *Baptisia tinctoria* ranges from southern New Hampshire to Minnesota and southward to Florida and Kentucky. It grows rather freely on sandy or gravelly soil and is common in these localities.

The species of *Baptisia* are structurally and biologically different from most of the Leguminosæ. They possess properties which apparently are undesirable for many insects and may account for their relative freedom from insect attack. Three glycosides; *baptin*, *baptisin* and *pseudobaptisin* and one alkaloid *baptitoxin* have been derived from *Baptisia*. A phenol, *baptinol*, has been extracted from the dried leaves of *Baptisia tinctoria* by means of vapors of chloroform and similar substances. The latter explains the characteristic blackening of injured *Baptisia* leaves which Clark (1915) remarks may be produced by any agent, physical, chemical or mechanical, that disturbs the normal relationship of the cells containing certain enzymes. First

<sup>1</sup> There has been some confusion in entomological literature recording insects from *Baptisia*. This is probably due to the fact that *Amorpha fruticosa* L. also bears the common name, false indigo.

a hydrolytic enzyme decomposes a glucoside and then an oxidase acts to produce the dark pigment. Wehmer (1911) states that *Baptisia tinctoria* probably contains a small amount of indican, a glucoside of indoxyl, from which indigo of commerce may be produced.

Early in summer, *Baptisia tinctoria* is a graceful, bushy plant with clean, deep green foliage. Its glabrous, trifoliolate leaves attract some insects which disfigure them in various ways. Several insects feed upon the seeds or contents of the pods while a few bore into the stems. The small, but distinct, yellow flowers appear about the first of June and are visited by many insects. During the course of the summer the foliage become riddled by the attacks of various insects and fungus diseases and by August the plants in most localities are almost completely defoliated.<sup>2</sup>

The insects feeding upon wild indigo naturally have a somewhat limited range coinciding with the distribution of the plants. Many of these insects seem to be confined to species of the genus *Baptisia*. All but one of the insects are native to North America. The coffee bean weevil, *Araocerus fasciculatus* (DeG.), originally introduced from India, has adapted itself to *Baptisia*, other weeds and cultivated plants. Authors have occasionally recorded some of the *Baptisia* insects as ranging to the Pacific; however, species of the genus *Baptisia* only occur east of the Rockies.

I have had an opportunity to study several rather uncommon insects that feed upon *Baptisia tinctoria*. These observations together with previously published records suggested a compilation of the species known to attack *Baptisia*.

#### A SUMMARY OF THE INSECTS ATTACKING *BAPTISIA* SPP.

##### Coleoptera

##### *Curculionidae*

*Araocerus fasciculatus* (DeG.). On the seeds of wild indigo, senna, cotton, cacao, coffee, poke berry and dried apple seeds,

<sup>2</sup> Eleven parasitic fungi have been recorded from *Baptisia*. Most of them are listed by Seymour (1929). They include two mildews, two rusts, three leaf spots and other disorders. The mildew *Erysiphe polygoni* D.G., which occurs on *Baptisia tinctoria* and *Baptisia australis*, appears to be the most prevalent species.

Mass., Ohio, D. C., N. J., Ala., Fla. (Blatchley & Leng: 42). Breeding in St. Ignatius bean (*Strychninos ignatii*) in the Philippines (Brown: 116).

*Apion rostrum* Say. Taken from the pods of false indigo, *Baptisia leucantha* in the seeds of which they live, New Hamp. to Fla., and west to Wis. and Texas (Blatchley & Leng: 81-82). Infests the seeds of *Baptisia leucantha* (Beutenmuller, 1890). Infests the seeds of *Baptisia leucantha* (LeConte & Horn: 411). The writer has found these beetles abundant on *Baptisia tinctoria* at Arendtsville especially early in June. On June 9 they were observed feeding on the leaves and flowers. On July 10 there was evidence of abundant oviposition. The eggs are pushed through small holes made at the base of the pods, usually one, sometimes two eggs in a pod. The egg is yellow elongate and almost as large as the seeds which are small at this time.

*Conotrachelus erinaceus* Lec. Taken on cotton and *Baptisia* in Texas (Pierce: 275). Occurs mainly beneath rubbish along the banks of streams; also on hickory. Ranges from Ohio and Northern Indiana to the District of Columbia, Florida and Texas (Blatchley & Leng: 482).

*Tychius sordidus* Lec. Breeds in the seed pods of *Baptisia bracteata* (Sanderson, 1904). Breeds in pods of *Baptisia leucantha*. The larvæ eat pods clean, sometimes two or three larvæ occur in a single pod. They then eat their way out and pupate in the ground (Pierce: 273). Ranges from Illinois and Iowa to Louisiana and Texas (Blatchley & Leng: 245).

*Lissorhoptrus simplex* Say. One specimen on *Baptisia*, Texas (Pierce: 265). Ranges from Canada and New England to Michigan and Iowa, south to Florida and Texas (Blatchley & Leng: 229). Apparently this species does not breed on *Baptisia* for Blatchley states "Water is the element in which this beetle delights, and it breeds only in plants growing in it."

#### *Chrysomelida*

*Pachybrachys luridus* Fabr. Occurs on the foliage of false indigo, *Baptisia leucantha*, also on the flowers of Jersey tea. Scarce in Indiana (Blatchley: 1130).

*Pachybrachys trinotatus* Mels. New Jersey on *Baptisia tin-*

*toria* and on *Ceanothus americana* (Smith: 302). This species has apparently been confused with *P. luridus* Fabr.

### Lepidoptera

#### *Ecophoridae*

*Agonopteryx lecontella* (Clem.). Food plant *Baptisia tinctoria* (Clarke: 95). Larva green, tubercles shiny black, a dark spot on each side of the prothoracic shield, a leaf roller on *Baptisia tinctoria* (Frost, 1945).

#### *Tortricidae*

*Grapholitha tristrigana* (Clem.). Larva on "Tinctoria" perhaps *Baptisia tinctoria*, Massachusetts to Florida, Kansas and Oregon (Forbes: 394). Food plant *Baptisia* and *Lupinus*; larva lives in seed pods and stems. Illinois, Kansas, Oklahoma, Alabama, Texas, Florida, North Carolina, Pennsylvania, New Jersey, New York, Massachusetts and Ontario (Heinrich: 39).

#### *Pyralidae*

*Tetralopha baptisiella* Fern. Larva on *Baptisia*, N. J., W. Va., and west, "New York." (Forbes, 1920.) *Baptisia tinctoria* Pa. (Frost).

*Tholeria reversalis* Guénee. Larva on *Baptisia* and *Lonicera*, N. Y., Ill., to Fla., and Colorado (Forbes, 1920). *Baptisia australis* Pa. (Frost).

#### *Hesperidae*

*Thanaos juvenalis* Fab. Food: bean (*Apios*), wild indigo (*Baptisia*), *Lathyrus* and *Galactia* (Beutenmuller, 1890b: 202). Ranges from Quebec to Florida and westward as far as Arizona where it appears to be common (Holland: 335). The writer has frequently observed the larva of a hesperid feeding on *Baptisia tinctoria*. The head and thoracic shield were dark brown or black, the former roughened and not shiny. The body was pinkish or brownish green, often olive in color. At first they ate small pieces of leaves, later they tied several leaves together to form a retreat in which they fed.

*Thanaos brizo* Boisd. Caterpillar feeds on *Galactia* and possible *Baptisia*, from the Atlantic to the Pacific, ranging from New England to Arizona (Holland: 333).

*Geometridæ*

*Cingilia catenaria* Drury. A general feeder, blackberry, cranberry, hazel, oak, Myrica, "Wild indigo," *Genista tinctoria*, *Carex pennsylvanica* and *Rhus toxicodendron* (Beutenmuller, 1890b: 221).

*Noctuidæ*

*Papaipema baptisiae* Bird. The caterpillar lives in the stem of *Baptisia tinctoria* Providence, R. I. (Beutenmuller, 1902: 434).

## Diptera

*Agromyza baptisiae* Frost. A linear-blotch leafminer on *Baptisia tinctoria*. Arendtsville, Pa. (Frost: 273).

*Agromyza species*. A petiole miner on *Baptisia tinctoria*. Makes a long narrow shallow mine sometimes 31 inches long, starting at the tip of a branch and working downward. Adults were not reared (Frost).

## Heteroptera

*Gelchossa heidmenni* O. & D. This tingid is one of the most abundant of the insects that attack *Baptisia tinctoria* in Pennsylvania. They make their appearance during May and by the end of the month their characteristic white stippling is very evident upon the leaves. During June the plants are still vigorous although the leaves may become almost white from the punctures of these insects. By the middle of August the leaves are so severely affected by these and other insects that they begin to fall and before the end of the month the plant may be completely defoliated. On False indigo *Baptisia tinctoria*, Mass., Pa., N. J., Md., D. C., La., Ark. (Weiss & West: 56-60).

*Hadronema militaris* Uhler. Food plant *Baptisia tinctoria*, Long Island and New York (Britton: 501). Colorado, Iowa, Michigan, Kansas, California, New Mexico (Van Duzee: 385). On *Baptisia leucantha*, New York west to the Pacific feeding on several species of *Baptisia*, also from Mexico (Blatchley, 1926: 884).

## Homoptera

*Macrosiphum solanifolii* (Ashm.). Colonies abundant on *Baptisia tinctoria* during May, June and July at Arendtsville. Ap-

parently a summer host. Identified by T. L. Guyton and J. O. Pepper. A common aphid with a wide distribution and a wide range of food plants.

*Jassus olitorius* Say. Nymphs and adults of this common species were found on *Baptisia* (Z. P. Metcalf, in correspondence). A shrub feeding species often taken on Sassafras during July, August and September (Britton: 142). Ont., Me., N. Y., N. J., Pa., N. C., Fla., Kans., Ariz., (Bermuda) (Van Duzee: 60). The writer has found nymphs and adults of a species of cicadellid on *Baptisia tinctoria* at Arendtsville, Pa.

#### Thysanoptera

*Sericothrips baptisiae* Hood. Apparently confined to *Baptisia tinctoria*, Virginia and Maryland (Hood: 113).

#### LITERATURE CITED

- BEUTENMULLER, WM. 1890. Food habits of North American Rhynchophora. Can. Ent., 22: 200-203, 258-261.
- . 1890b. Catalogue of the Lepidoptera found within 50 miles of New York City, with their food plants. Annals N. Y. Acad. Sci., V.
- . 1902. Descriptive catalogue of the Noctuidæ found within 50 miles of New York City, part II. Bull. Amer. Mus. Nat. Hist., 16 art. 33.
- BLATCHLEY, W. S. 1910. Coleoptera or beetles known to occur in Indiana. Nature Publishing Co.
- , and C. W. LENG. 1916. Rhynchophora or weevils of North Eastern America. Nature Publishing Co.
- . 1926. Heteroptera or true bugs of Eastern North America. Nature Publishing Co.
- BRITTON, W. E. 1923. Guide to the insects of Connecticut, part IV, Hemiptera or sucking insects of Connecticut. State Geol. and Nat. Hist., Survey Bull. 34.
- BROWN, R. E. 1906. Notes on the breeding habits of *Aræocerus fasciculatus*. Jour. N. Y. Ent. Soc., 14: 116.
- CLARK, E. D. 1915. Notes on the blackening of the leaves of wild indigo (*Baptisia tinctoria*) and the isolation of a new Phenol, *baptisol*. Jour. Biol. Chem., 21: 646-660.
- CLARKE, J. F. G. 1941. Revision of North American moths of the family Geophoridae, with descriptions of new species. Proc. U. S. Nat. Mus., 90 (3107).
- CZAPEK, F. 1921. Biochemie der Pflanzen. Gustav V. Fischer, Jena.
- FORBES, WM. T. M. 1920. The Lepidoptera of New York and neighboring states. Cornell University Memoir 68.
- FROST, S. W. 1931. North American Agromyzidae (Dipt.). Can. Ent., 63: 275-277.

- . 1945. The larva of *Agonopteryx lecontella*. Jour. Econ. Ent., 38(1): 126.
- GORTER, K. 1897. Über die Bestandteile der Wurzel von *Baptisia tinctoria*. Arch. d. Pharm., 235: 301-302.
- HEINRICH, CARL. 1926. Revision of the North American moths of the subfamilies Laspeyresiinae, and Olethreutinae. U. S. Nat. Mus. Bull. 132.
- HOLLAND, W. J. 1907. The butterfly book. Doubleday, Page & Co.
- HOOD, J. D. 1916. Descriptions of new Thysanoptera. Proc. Biol. Soc. Wash., 29: 29-113.
- LARISEY, M. M. 1940. A monograph of the genus *Baptisia*. Ann. Mo. Bot. Gard., 27(2): 119-224.
- LE CONTE, J. L., and HORN. 1876. The Rhynchophora of America north of Mexico. Proc. Amer. Phil. Soc. 15(96).
- SANDERSON, E. D. 1904. Insects mistaken for the Mexican cotton boll weevil. Texas Agric. Exp. Sta. Bull., 74: 3-13.
- SEYMOUR, A. B. 1929. Host index of fungi of North America. Harvard Univ. Press.
- SMITH, J. B. 1900. Insects of New Jersey. Twenty-seventh Ann. Rept. State Board Agric. for 1899.
- VAN DUZEE, E. P. 1917. Catalogue of the Hemiptera of America north of Mexico. Univ. Calif. Press.
- WADE, J. S. 1935. A contribution to a bibliography of the described immature stages of North American Coleoptera. Bur. Ent. and Plant Quarantine, Wash., D. C., E-358.
- WEHMER, C. 1911. Die Pflanzenstoffe. Gustav v. Fischer, Jena.
- WEISS, H. B., AND E. WEST. 1924. Notes on the false indigo lace bug, *Gelechossa heidemanni* O & D. in New Jersey (Hem. Tingidæ). Ent. News 35(2): 56-60.